

Dr. Laura Nelson:

- Welcome and introductions
- Utah Energy Forum started out at Wasatch Energy Breakfast. Then in September 2006, Rocky Mountain Power and Rich Walje felt that this could be expanded. We were in a new era of energy and energy development and demand. This was expanded to include more than utilities, and address a full spectrum of energy needs. This is a time of emerging technology and alternative energy development for oil shale and tar sands and our mainstay of Utah energy, coal and mining.
- Thank you to DNR and John Baza for our meeting room. Thank you to OSEC and Utah Mining Association, the co-sponsors.

Representative Roger Barrus:

Legislative update

- Will provide more information next meeting. The Energy Workgroup has put together a group of bills that are energy policy type bills: conservation, regulation, production, siting authority, etc. Hopefully can get an energy day and present all the bills together. These bills are a result of the effort of many people here today and we are excited to move forward on how to address energy policy, production, conservation, and regulation

Dan Elcan, Managing Partner OSEC:

Update on RFP for RD&D project

- Submitted Request for Proposal for RD&D project and it was accepted. There were 11 proposals. Utah received one lease. Colorado has 5, but they are all in situ. These RD&D leases are to evaluate potential for development in our states in an economic and environmentally conscious way. We will need the full spectrum of technology if we move in this direction. We appreciate the vision and commitment of this State.
- We have been in the energy business for over 50 years and look for other investments in this business. When we looked into Oil Shale and we found out about the RD&D lease. We submitted an application in March of 2006 for the RD&D Lease and were selected. We have been completing an Environmental Assessment up until this time. Third draft was submitted yesterday to BLM and we are hoping for the lease and to move forward.
- DVD: 30 billion barrels of oil worldwide, and over 7 billion barrels in the US. Worldwide demand continues to rise, but development peaked and most operations are declining in production. There has been new drilling, but no new major oil fields in the past 15 years. We consume 6 barrels for every barrel we find. Oil prices have skyrocketed and have topped at \$76.00. Department of Defense is the largest consumer of fuels in the nation.
- In terms of oil shale, we are the richest country in the world at 2.5 trillion barrels estimated. If we can recover it, these reserves would have more than all the proven resources in the Middle East. 72% of the oil shale is in the US Green River Formation. This is enough oil to meet our present demand for 400 years.
- Process: Take the oil shale and heat it for the Kerogen. Then it is separated from the rock, and the oil is refined.
- The White River Mine sits on 160 acres of one of the richest areas of the Green River formation. Philips Petroleum Company, Sunoco Energy Development Company, and Sohio Shale Oil Company leased it, and spent over 3 million building on it. Then they relinquished

Draft Notes

Dr. L. S. Nelson, Energy Advisor

Utah Energy Forum December 15, 2006 Meeting

their lease in the 80's when the oil price went down. Now it is open again. OSEC was selected as the lessee. 9 Million barrels recoverable on property, with additional property near 280 million barrels.

- 4 Phase Plan:
 - OSEC RD&D Phase One: Sign Lease. Prepare and ship to Canada for processing.
 - Phase Two: Relocate ATP pilot plant to White River Mine
 - Phase Three: Build and Operate a large demonstration plant
 - Phase Four: Evaluate first three plans and then build fully functioning plant
 - We will also provide shale for other researches
- We will use room and pillar mining and the Alberta Taciuk Process. Crush oil shale in retort and heat it to 799-900 degrees Fahrenheit.
- The benefit is a long term energy source, jobs, lower prices, tax decrease, industrial leaders, and keeping the money in the US.
- We will use best practices for the environment and keep green house gases down.
- We are committed to education, training programs, degree opportunities, and scholarships
- Government is very supportive, Senators personally visited the site
- 2 million barrels a day by 2020. Canada does 1.1 million barrels per day.
- Questions?
 - Early program for oil shale? No guaranteed contract? Are we going to solicit from government price flooring or guaranteed long term contract? Yes, we have drafted legislation that includes contracts and price guarantees. Department of Defense is interested in oil shale and alternative energy
 - How much electricity are you going to need for this project? We chose ATP process because it is rotated slowly to preheat and then to retort and gasified, collected and condensed to oil as spent shale out of retort. It goes into out chamber and still substantial carbon left, but air is added and then it combusts and then heats the chamber. It will self heat from that point on.
 - BTUs input to get a BTU output? Once process starts, other than computers and heating, the plant really takes care of itself. We will be producing far more than using. How much water do you use? The process itself does not use water, preheat process takes all water out of shale. Water used will be as a dust control and cool spent shale, approximately 1 or 2 gallons of water for every barrel of oil.
 - No green house gases? Not true, it does create CO₂, but we are working on CO₂ sequestration and putting it into deep wells. What CO₂ technology are you using? We are just now starting to design the plan and it is not finalized yet, we will have an update later on that.
 - How much spent shale is produced per barrel and how is it used? Amount is used is for every ton of oil shale and is 80-85% is residual spent shale. The shale is an inner product and we are working with a couple different specialists to see what else we can use it for, such as construction, roadbed, hardy board. If not, we have onsite gilsonite mining and can put it there.
 - Primary problem is volume change, leeching rates on water infiltration, leaking into groundwater. How are you going to prevent? We are running a test in Calgary, initially a pit to collect spent shale and testing to see if it is environmentally unfriendly after it has gone through the process. If so, we will try to treat it and dispose of it.

Draft Notes

Dr. L. S. Nelson, Energy Advisor

Utah Energy Forum December 15, 2006 Meeting

- Laura: The RD&D process is to answer these types of questions and any environmental questions. The PEIS really is a policy statement and will evaluate if it is economic and if it is considered to be mining or oil and gas.

Jeff McKinley: Bureau of Land Management

PEIS Update

- We are not on schedule, but should be done late spring or early summer. We had to look at some alternate options. PEIS will amend current land use plans and provide a leasing mechanism.
- The first plan is to identify where oil shale and tars sands are open for development. 20 years of in situ, underground mining, with surface retort. There is the OSTSES (Oil Shale Tar Sands Environmental Statement) website for comments.
- Laura: Federal Unconventional Fuels Task Force. Coal has been a mainstay, including mining in general such as Kennecott, Rio Tinto, and is still a great opportunity for development of Utah's energy resources and support our rural communities. Next we will look at the future of Utah coal. The Coal Advisory Group really helped with the Energy Report, and David Litvin was a key contributor.

David Litvin, President, Utah Mining Association

Future of Utah Coal

- 6 Billion dollars in exports, nearly half of that is Utah minerals industry. It is a role they have played for nearly 100 years. The most economic benefit to our state and industry was Kennecott mine. They still continue to supply economic wealth to this state.
- Future of coal is always a snapshot in time, answers are always changing. However, if the current trend to lock away resources continues, even in 5 years we would see a drastic change and our resources would be even more limited. Don't concentrate on numbers, instead look at the magnitude of the picture. (Map of coal bearing areas)
- Price/Central Utah is where all mining has been in. There are 9 billion tons of coal in Escalante, less than 2 billion in Price. There are 13 operating mines in three counties: Carbon, Emery, Sevier, Sanpete. We have extracted nearly 40% of the reserves. 960 millions tons to date, from these places. There is about 2300 million left. The quality of that coal is not as good, it is much deeper and more expensive to extract. Utah coal resources are being consumed at a much higher rate than in the past, and further higher rates of production will be needed to meet expected consumer demand
- State has 13 coal mines that are all underground, and are the deepest coal mines in the US. This is 1800 jobs, which are some of the highest paying jobs in the state. For every mine job, a secondary 5 to 7 jobs are created including electricity, equipment manufacturing, consultants, safety, etc.
- Publicly traded coal operations in Utah in these areas list coal reserves of about 380 million tons, which would last 15 years. Some estimate that there is over 1400 million tons of mineable coal left, which would only last until 2060 at our current 25 millions tons production rate.
- Utah coal is higher cost, because it is deeper and more expensive to mine. Our coal is the best coal in the US because of the lowest ash, mercury, sulfur content and some of the highest BTU. 40% of our coal is exported out of Utah, mainly to Nevada. 3 mines are in various stages of permitting: Lila Canyon, Razor Mines, and Alton.

Draft Notes

Dr. L. S. Nelson, Energy Advisor

Utah Energy Forum December 15, 2006 Meeting

- The consumers of Utah coal, which sign 20-30 year contracts are making decisions that would questions the reality of the remaining 50 year supply. They are getting more coal imported from Wyoming and Colorado. Reliability of supply: It HAS to be available. Large consumers of coal are worrying about the amount of coal left. New power plants in construction in Utah are being designed to burn Wyoming coal as well as Utah. We consume about 77% of our own coal. If coal goes up, then electricity rates will increase as well.
- The benefit to the State with coal generation for electricity: low cost electricity attracts industry and residents. Mining jobs are stable long term and highest paying jobs, often in remote rural areas. If Utah wishes to sustain a coal mining industry and use coal fired electric power generation, the State and the coal industry will have to look to other coal areas in the State for mineable coal. 63% has been taken off the table with no public input. The best remaining coal reserves, high BTU and low sulfur are located in the Kapirowits Plateau, now in the Escalante Monument. For a viable coal industry in Utah, this are is critical. We have to look at where we are going to get our energy in the future. It can be done in a responsible and environmentally friendly way.
- Questions?
 - What political action is needed to release the Escalante National Monument? This has to be taken to the United States Congress. This is our issue, and we have to take it up. This was not even originally part of the environmental ethic, it was added by Clinton at the last moment.
 - Can you tell us about coal prices? Fluctuate, history? Coal prices are set by long term contracts, 20-30 years. About \$20 per ton. Utah coal producers locked into long term contracts.
 - What data is available of unmineable coal? Too deeply buried? Some of the assumptions:
 - Technical consideration: accessible, developable, transportable,
 - Economically recoverable: marketable, profitable, cost effectively minable with enough thickness, and enough coal there to pay back cost of mine
 - Geologic: If it is beyond 3000 feet, geologic areas: stable bed etc.
 - Legal considerations: It must be available for development both now and in the future.
 - No undue environmental and permitting considerations.
 - Do you have data of quantities of coal in mine not going to be developed? Yes I do but did not bring it.
 - Laura: People have a perception of coal mining and the environment. How are mining operations responsive to environmental concerns? It is important to note that just like any industrial operations in state, they follow all environmental requirements and land use requirements. They have to post bond, have to clean up, protect water and air resources, no undue impacts beyond what is allowed beyond law. People think of pictures from 100 years ago. It is not like that
 - We are also developing how we use it. Utah's waste coal, we are looking at opportunities to use it. We have to consider the full spectrum of technologies. When we look at IGCC, Utah coal is the best coal for that because of low water content. The time line may be shorter for coal to liquids technology. Department of Defense largest consumer of fuels and is looking at synthetic fuels for jets. Don Symonds will talk more about some of the technology.

Draft Notes

Dr. L. S. Nelson, Energy Advisor

Utah Energy Forum December 15, 2006 Meeting

Don Symonds, Chairman, Norwest Corporation

Coal Technologies

- Northwest is an energy minerals consulting company, mostly dealing in oil sands, but does a lot with the coal industry.
- I will cover Gasification, Coal to Liquids, and Integrated Gasification Combined Cycle (IGCC.) I will compare the technologies, answer what is holding us back, industry status, and discuss CO2 sequestration.
- Gasification: Coal is taken and subjected to hot steam and air, under high temperatures and pressures in a reactor. This produces carbon monoxide, hydrogen, and gas, though it must be cleaned up before product use. The byproducts are slag, CO2, hydrogen. This produces a high quality diesel with low pollutants. There are 117 gasification plants worldwide, 20 in the US. It is cheaper per barrel.
- SASOL big producer. They use Fischer Tropsch
- IGCC disadvantages are more capital and higher operation and development costs, with carbon sequestration it will cost 7 to 14% more on top of the higher costs.
- IGCC advantages are half NOx and Sox emissions, much better Hg removal, insert slag, 30-50% less water use, with CO2 sequestration 9-15% lowers costs/kwh, future potential for reducing costs as technology matures.
- What is holding us back? Costs, emission regulation uncertainty, not sure on future oil and natural gas prices, difficult to finance large multibillion dollar projects. However, it has tremendous potential and cost savings. A few things will accelerate development: government association (tax credits, loan guarantees, creative financing incentives, Coal to liquids full promotion), need more full scale projects which would reduce upfront capital and increase availability, and CO2 related legislation.
- CO2 is sequestered into coal bed methane or reservoirs.
- What does Utah have to offer? Reserve base of high quality coal, history of coal mining and good labor force, high ranking coal for IGCC, supportive state government, and good sources for CO2 sequestration including enhanced coal recovery and coal bed methane sites
- Gasification, Coal to Liquids, and IGCC similar technologies. They are higher cost and risk without incentives. The benefits would be energy security and local jobs. We will have to see what happens after the presidential election in 2008. Utah could be a preferred location for these technologies.
- Questions?
 - Why higher diesel? Lower sulfur content, (similar to octane ratings)
 - \$50 carbon taxing in new legislation? This will hit the coal industry hard, promote some of these technologies, but have a tough impact on conventional (though it is not currently in Utah Legislature.)
 - Project costs would be for a \$30 dollar per ton tax, with increased efficiencies over the net year, with the costs of power going down.
 - The Government is looking at more suitable reserves for CO2. I think that some CO2 legislation may be coming and we need to embrace the opportunity and see how it can help us in the industry. We need to look at inventory and emission levels.

Laura Nelson

Next Steps

- This is a three legged stool: Energy, Economics, and the Environment. They are all tied together and we need to make sure our measures are reasonable, promote balance, and

Draft Notes

Dr. L. S. Nelson, Energy Advisor

Utah Energy Forum December 15, 2006 Meeting

overcome challenges to meet the increasing energy demand. These answers must be long term and sustainable.

- Next meeting will be in March. We will discuss recent legislation and perhaps Blue Ribbon Council on Climate Change.
- Next forum will be in June, September, and December. If you have any ideas or topics you want to discuss, please let me know.